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Cycling under the influence of alcohol and drugs: current situation and risks

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Abstract

Cycling becomes more and more popular, especially among young people who favor active modes of transport. Drinking and drug use is also more common among young people and affect their capability of driving. The objective of this paper is to present the exploration of cycling under the influence of alcohol and drugs conducted in the framework of the research project titled "Velivr" through a questionnaire survey among IRTAD Group members and a quantitative survey among cyclists in Paris. Results showed that in many countries safe cycling attracts growing attention but the vulnerability of cyclists is not fully realised. The CUI problem is not appropriately addressed through insufficient enforcement and provision for measures to prevent it. All in all, cycling under the influence of alcohol and/or drugs is a problem growing in parallel with cycling itself.

Keywords: Cycling, alcohol, drugs, survey, IRTAD, Velivr

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1. Introduction

1.1. Context

The great increase in bicycle kilometers in the urban and peri-urban context is a recent finding worldwide. This is due to the availability of shared bicycle sharing systems and the widespread use of bicycles for commuting, to make deliveries at home and for sightseeing. Moreover, a change of mentality especially among young people who are less and less motorized and favor the use of active modes is observed. An even greater increase in bicycle mileage is foreseeable as a significant number of major cities are interested in studying or setting up an extensive network of cycle paths.

Cycling offers important benefits, such as improved health and affordable mobility, while reducing negative effects of transportation in terms of environmental pollution, noise and roadway congestion. Cycling is therefore strongly encouraged by governmental policies of many countries and it is expected to become a central part of the mobility solutions in many cities (Stelling-Kończak, 2018). Furthermore, an increasing number of EU countries are adopting national strategies to promote cycling, so it is possible that in recent years more people are choosing cycling as a means of transport (ETSC, 2016).

By conducting a cross-analysis of the motives of the trips made by bicycle and the public concerned, it is found that a large part of these kilometers are travelled by young people under 30 for leisure activities and night outings. However, it is clear that young people are accustomed to consuming alcohol (and drugs at a lower frequency) during their outings. Thus, it can be assumed that alcohol and drug problems could further increase the vulnerability of young cyclists. In this target group three risk enhancing factors are concentrated: (i) youth (ii) alcohol and drugs, (iii) vulnerable users. However, Blood Alcohol Content Limits (BACs) rarely target cyclists and the legislation does not seem to be adapted to the particularities of the subject.

1.2. The problem

Driving motor vehicles is a complex activity that mobilizes physical, mental and social skills. The consumption of alcohol and drugs significantly degrades these skills and generates effects such as reduced visual field, longer reaction time, poor "reading" of information and the road environment, increased aggression and risk taking (Christoforou et al., 2012; Christoforou et al., 2013). As a result, drivers who have consumed alcohol and other substances are over-represented in the statistics of involvement in serious and fatal accidents.

Cycling is an activity that is more challenging than driving because it involves more skills such as balance, physical activity and night vision. In addition, cyclists themselves are less visible to other drivers at night; they are more exposed to weather conditions and have less means of protection against shocks. More than 2,000 cyclists were killed in road crashes in the EU countries in 2015, which constitutes 8% of the total number of road fatalities (European Commission, 2017). They are therefore much more vulnerable than motorists in the event of an accident. Moreover, the effects of blood alcohol levels are increasing for cyclists. Dehydration due to alcohol is more acute and the control of the vehicle and the coordination of the body are much more difficult.

Various statistical studies confirm these last observations. Alcohol consumption is one of the leading causes of accidents among cyclists for single-vehicle crashes (TRL, 2009). Drunk cyclists are primarily injured in the evening, weekend, on their way home from a party, restaurant or bar, and rarely wear helmets (Anderrson & Buketrop, 2002; Kaplan et al., 2014). In addition, it appears that cyclists who have been injured after drinking have suffered more serious injuries, are hospitalized for longer, and have significantly higher health costs (Spaite et al., 1995).

Despite the strong increase in the modal share of cycling in major European cities, the subject of cycling under the influence of alcohol and drugs does not seem to have attracted enough attention from researchers and authorities. Recent scientific studies are almost non-existent, alcohol control is very limited and the relative legislation has not been adequately adapted. In most cases, the alcohol limit allowed is the same as that applicable for motorists (0,5g of alcohol per liter of blood). Fines can be different or not. In England, the maximum fine for cycling under the influence of drugs or drunkenness is £1.000, which is also the fine for 'lack of attention' when riding a bicycle. The maximum fine for cycling is £2.500 and concerns 'dangerous driving'. British cyclists reserve the right to

refuse alcohol checks. In Belgium, the police have the right to withdraw the driving license of drunk cyclists. The Netherlands is one of the least alcohol consuming countries in the European Union. However, a recent study by the Dutch Road Safety Institute (SWOV, 2015) found that 68% of cyclists who cycle out in the evening are under the influence of alcohol, while the fine is only 140 €.

Within the aforementioned context, the present study aims to present the results of a questionnaire survey among OECD countries focusing on the collection of information about rules and data and a quantitative survey among cyclists in Paris both concerning driving a bicycle under the influence of alcohol and drugs ("Cycling Under Influence" - CUI). The surveys were conducted within the framework of the Veliviv' research project, carried out by the French Institute of Science and Technology for Transport, Planning and Networks (IFSTTAR) and the National Technical University of Athens (NTUA) for the French Interministerial Delegate for Road Safety.

2. Survey among IRTAD Group members

In order to collect information about rules and data concerning driving a bicycle under the influence of alcohol and drugs, a questionnaire survey was designed by NTUA and dispatched to IRTAD countries.

The questionnaire comprises of the following 10 survey topics:

- Minimum age for allowing cycling.
- Obligatory equipment for cyclists and the bicycle.
- Areas / road types where bicycles are allowed to travel.
- BAC limit especially for cyclists.
- Fine or other type of penalty especially for CUI.
- Results of police controls on CUI.
- Specific measures applied to prevent the consequences of CUI.
- Specific measures applied to reduce the consequences of CUI.
- Study(ies) or research on CUI.
- Available data.

A total of 15 IRTAD members responded to the survey (Austria, Chile, Czech Republic, France, Germany, Greece, Hungary, Ireland, Luxembourg, Netherlands, Serbia, Slovenia, Spain, Sweden, Switzerland). Results from the survey are reported in the following paragraphs "by topic", and for each topic of the questionnaire aggregated results are provided.

3. Results from IRTAD Group members

3.1. Minimum age for allowing cycling

According to the responses provided in the survey (Table 1) approximately half of the countries do define a minimum age for allowing cycling on the road (Figure 1). Ten to twelve years old is a common age range for allowing independent cycling. In most of these countries, accompanied cycling is also foreseen. For example, in Switzerland children may cycle on main roads before the age of 6 but only under the supervision of a person at least 16 years old, while in Serbia a child below the age of 9 is allowed to ride a bicycle in a pedestrian zone and a slow traffic zone if accompanied by a person above the age of 16. In Slovenia children from 8 to 10 normally obtain a bicycle driving license (cycling card) in their school. Children without cycling card under 14 years old, can only drive their bike if accompanied by an adult. Children under 6 years can drive only on pedestrian zones accompanied by an adult. In Germany, children under 8 years of age must use the footway for cycling; older children under 10 years old may use the footway for cycling and they must show particular consideration towards pedestrians. A parent or other guardian may accompany the child on the footway. The children must dismount from their bicycle when crossing a carriageway.

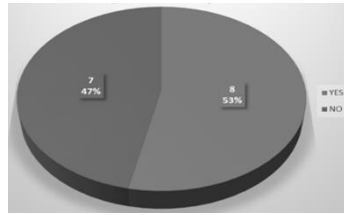


Fig. 1 Existence of age limit for cycling in each country

Table 1: Minimum age for cycling on the road alone or accompanied

Country	Minimum Age (y.o.)	Accompanied
Austria	12 y.o. (10 y.o. with cycling license)	<12 y.o. (<10 y.o. with cycling license)
Chile	no minimum age	no restriction
Czech Rep.	10 y.o.	<10 y.o.
France	no minimum age	no restriction
Germany	8 y.o. (outside footways)	no restriction
Greece	no minimum age	no restriction
Hungary	12 y.o. (only for main roads)	no restriction
Ireland	no minimum age	no restriction
Luxembourg	10 y.o.	from 6 y.o. to 10 y.o.
Netherlands	no minimum age	no restriction
Serbia	12 y.o. (public roads) 9 y.o. (pedestrian, slow traffic, "30" zone, school area, unclassified road)	< 9 y.o. (for pedestrian and slow traffic zone)
Slovenia	8 y.o. (with cycling card)	< 14 y.o. (without cycling card) < 6 y.o. (only on pedestrian zone)
Spain	no minimum age	no restriction
Sweden	no minimum age	no restriction
Switzerland	6 y.o. (on main roads) no (on other roads provided the child can cycle seated)	< 6 y.o. (on main roads)

3.2. Obligatory equipment for cyclists and the bicycle

Concerning the obligatory equipment for the bicycle in all countries almost the same bicycle equipment is required. That is two break systems, white front light and red rear light, reflective elements and sound device (Table 2).

Table 2: Obligatory bicycle equipment

Country	Mandatory equipment for the bicycle
Austria	2 independent brake systems, reflective elements on the front, rear, pedal and wheels, sound device
Chile	frontal light, rear red light, reflective elements, sound device
Czech Rep.	brakes, lights
France	lights, bell and reflective devices on the pedals and the wheels
Germany	2 independent brake systems, lighting, spotlights, sound device
Greece	2 independent brake systems, white/yellow front light, red light, reflective backlight, side and pedal reflectors
Hungary	2 independent brake systems, lights, reflectors, sound device
Ireland	2 brakes, white front - red rear light, sound device
Luxembourg	white/yellow front - red rear light, rear, pedal and wheel reflectors
Netherlands	lights (front/rear), wheel/tyre/fender, pedal and rear-reflection, sound device
Serbia	2 brakes, white front - red rear light, wheels reflectors, sound device
Slovenia	front and rear brake, white front - red rear light, rear, wheels and pedal reflectors, sound device
Spain	lights, reflectors
Sweden	brake, lights and reflectors only in darkness, sound device
Switzerland	2 brakes, lights, reflectors, tyres of approximately the same elasticity

Regarding the obligatory cyclist equipment (Figure 2) in half of the countries, a helmet is mandatory but only up to a certain age. In Czech Republic and Slovenia helmet is obligatory up to the age of 18, in Austria and France up to the age of 12 and in Sweden of 15. In Chile in addition to the helmet, it is also mandatory for the cyclist to

wear reflective vest, harness or shoulder strap from half an hour after sunset until half an hour before sunrise. As for Hungary, reflective vest is obligatory only outside built-up areas and under low visibility conditions, and helmet is obligatory only outside built-up areas and for roads with a speed limit higher than 40km/h. In France, it is mandatory for cyclists to wear reflective vests, outside the cities, only at night and under low visibility conditions.

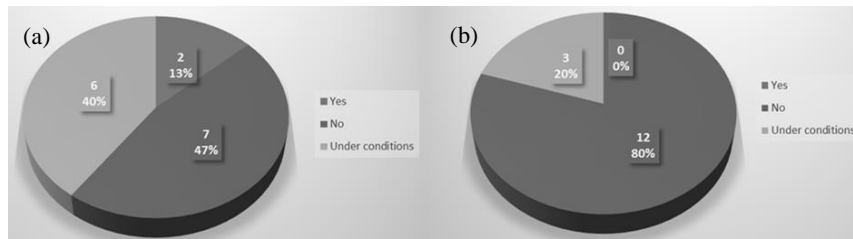


Fig. 2 Type of obligatory equipment for cyclists (a) helmet; (b) reflective vest, harness or shoulder strap

3.3. Areas / road types where bicycles are allowed to travel

In most of the countries, there is provision for the safe movement of bicycles on dedicated paths or at least on specific areas or roads (Figure 3). In many countries such as Netherlands bicycles are generally allowed on all roads, unless it is specifically prohibited. In most of the countries, cyclists travel on cycle paths (Austria, Chile, Czech Rep., Hungary, Ireland, Luxembourg, Serbia, Slovenia, Switzerland) if these exist, and in the absence of cycle paths they use either the hard shoulders (e.g. Spain) or the right side of the road (Chile, Slovenia and Sweden). In some countries, there are regulations regarding cycling on the sidewalks or pedestrian zones. In Ireland, cyclists are not allowed to proceed into a pedestrianized street or area, unless there is a cycle track provided and they must cycle on a contra-flow cycle track in the direction indicated by it. As for France, it is forbidden for cyclists to travel on sidewalks (except for children under the age of 8 years old) or on pedestrian roads.

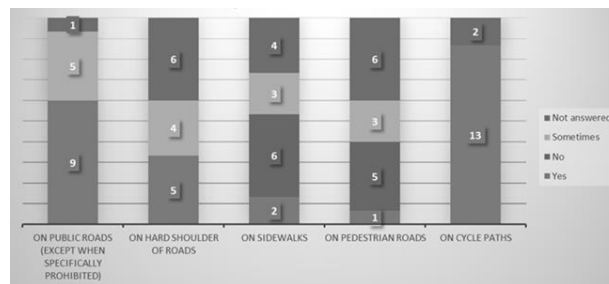


Fig. 3 Areas/road types where bicycles are allowed to travel

3.4. BAC limit especially for cyclists

According to the questionnaire survey (Figure 4 and Table 3), most of the responding countries have defined a Blood Alcohol Content Limit (BAC) for cyclists. In Greece, Hungary and Ireland there is no BAC limit for cyclists. In Sweden, in principle, there is no BAC limit for cycling; according to the Swedish Traffic Regulations, anyone able to cycle safely is acceptable on the road. The assessment of “safely” is performed on a case-by-case basis. In Austria and Germany BAC limit for cycling is higher than the standard limit for drivers and in Slovenia lower. In Switzerland BAC limit for cyclists is 0,5%. In all other countries, BAC limit is the same for drivers of all types of vehicles, including cyclists.

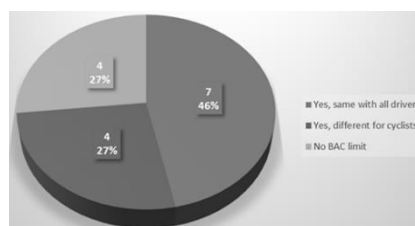


Fig. 4 Existence of BAC limit for cyclists

Table 3: BAC limit for cyclists

Country	BAC Limit
Austria	0,8
Chile	same as for drivers
Czech Rep.	same as for drivers (0)
France	same as for drivers
Germany	1,6
Greece	no BAC limit
Hungary	no BAC limit
Ireland	no BAC limit
Luxembourg	same as for drivers
Netherlands	same as for drivers (0,2-0,5)
Serbia	same as for drivers (0,2)
Slovenia	0
Spain	same as for drivers (0,25)
Sweden	no BAC limit
Switzerland	0,5

3.5. Fine or other type of penalty especially for CUI

According to the responses provided in the survey in most of the countries, there is no special fine for CUI (Figure 5). In Austria, Czech Republic, France, Hungary, Serbia and Slovenia the fine for cycling under the influence of alcohol is the same as for all vehicle drivers, while in Chile, Greece, Luxembourg, Netherlands and Sweden there is no fine at all. In Germany, if a cyclist is driving with 1,6BAC or higher there is a fine; however the height of the fine not mentioned in the German response. In Spain, the fine imposed on a cyclist who exceeds the blood alcohol level is 500€ and in case of recidivism within one year 1.000€. Furthermore, in case of presence of drugs in cyclists' blood the fine is 1.000€. In Ireland, there is a fine up to 2.500€ and in Switzerland up to CHF 10.000 (approximately the equivalent of 8.800€).

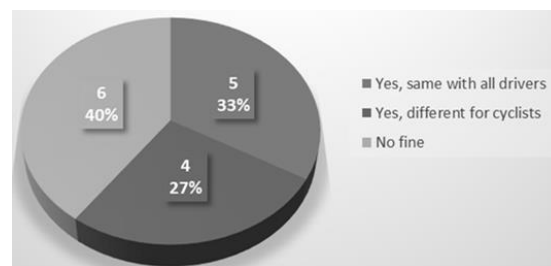


Fig. 5 Existence of special fine for cyclists driving under the influence of alcohol and/or drugs

Regarding other types of penalties applied to cyclists driving under the influence of alcohol and/or drugs, most countries responded negatively (Figure 6). In Austria, in case of repeat offences or in case of very high BAC, the license can be revoked and driver improvement and psychological assessment may be required. In Germany, if a cyclist is driving with 1,6BAC or higher, except for the fine, a penalty points system may be applied and a medical-psychological assessment may be requested. In Hungary, in case of an accident involving serious injury or fatality caused by a cyclist under the influence of alcohol, a criminal procedure will be initiated. In Switzerland, driving license may be withdrawn in the suspicion that cyclist has a structural drinking problem until proven otherwise. Finally in France, a cyclist found driving with 0,8BAC or higher, is prosecuted in court.

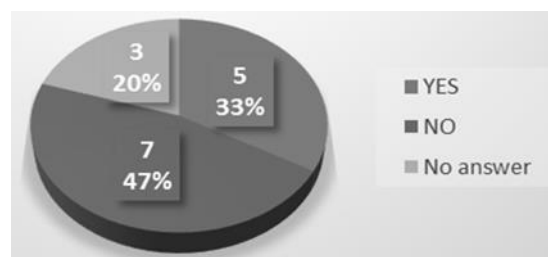


Fig. 6 Existence of other type of penalty for cycling under the influence of alcohol and/or drugs

3.6. Results of police controls on CUI

As shown in Figure 7 below, in most countries results of police controls on CUI are either not available or not distinguished from other police control data. Only in Netherlands and Switzerland, the results are obtainable. Austria, Luxembourg and Sweden did not respond to the specific question.

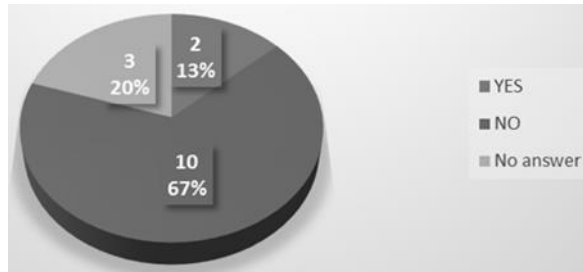


Fig. 7 Availability of police control results on cycling under the influence of alcohol and/or drugs

3.7. Specific measures applied to prevent or to reduce the consequences of CUI

Regarding specific measures applied to prevent CUI, most countries either responded negatively (Chile, Czech Republic, France, Greece, Netherlands and Switzerland) or did not answer at all (Austria, Hungary, Luxembourg and Sweden) (Figure 8). In Slovenia and in Spain, reported measures concern education and information of all drivers but not cyclists in particular. In Germany, communication measures are applied to prevent CUI. In Serbia, prevention measures comprise information campaigns and traffic controls.

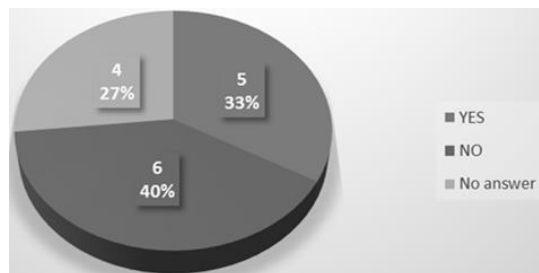


Fig. 8 Existence of specific measures applied to prevent cycling under the influence of alcohol and/or drugs

Concerning specific measures applied to reduce the consequences of CUI (Figure 9), the high number of negative responses and no answers indicates a lack of activity in this field. In Slovenia, there is a preventive campaign for cyclists that may reinforce awareness among them. In Spain, the measures applied to reduce the consequences of cycling under the influence of alcohol and/or drugs are control and monitoring actions.

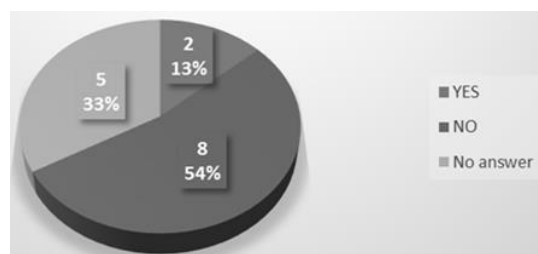


Fig. 9 Existence of specific measures applied to reduce consequences of cycling under the influence of alcohol and/or drugs

Therefore, measures concerning cycling under the influence of alcohol and/or drugs are implemented in only a few countries. The reported measures mostly concern education and information, targeted however to all drivers and not cyclists in particular.

3.8. Available data

In the majority of the examined countries, road safety outcomes concerning CUI are available. More specifically in Serbia, in 2017, there were 170 traffic accidents involving cyclists being under the influence of alcohol; in these accidents, 9 cyclists died, whereas 168 were injured. Furthermore in Hungary, the number of injury accidents caused by cycling under the influence of alcohol were: in 2015 381, in 2016 370, in 2017 308 and in the first half of 2018 148, which means a 23,3% increase in comparison with the same period of the previous year.

On the other hand, cycling exposure data, such as cycle-kms and person-kms, are very limited. Only in Germany, Netherlands, Sweden and Switzerland cycling exposure data are available; as for Slovenia, cycling exposure data are only available in the municipalities of Ljubljana and Maribor.

Regarding performance indicators data on CUI, only in Sweden it is mentioned that there are available data in the in-depth studies of fatal accidents.

Except for Slovenia, no other country provided information about the availability of data for inside or outside urban areas and during daylight or night-time. According to the Slovenian response, in 2017 there were 11 fatalities among cyclists, 2 of them under influence of alcohol. In the same year, cyclists under influence of alcohol caused 107 traffic accidents; 89 of them were in urban areas and 65 of them were during daylight. In 2017, just 1 cyclist was under the influence of drugs.

The availability of CUI statistical data of the examined countries is presented in Table 4 below.

Table 4: Availability of CUI statistical data

Country	Accidents	Fatalities	Injuries	Exposure data	Performance Indicators
Austria	-	-	-	-	-
Chile	no	no	no	no	no
Czech Rep.	yes	yes	yes	no	no
France	yes	yes	yes	-	-
Germany	yes	yes	yes	yes	no
Greece	yes	yes	yes	no	no
Hungary	yes	-	-	-	-
Ireland	yes	yes	only serious	no	no
Luxembourg	yes	yes	yes	-	-
Netherlands	no	no	no	yes	no
Serbia	yes	yes	yes	-	-
Slovenia	yes	yes	yes	specific municipalities	-
Spain	no	no	no	no	no
Sweden	yes	yes	yes	yes	yes
Switzerland	yes	yes	yes	yes	no

4. The French context

In the framework of the Velivir 'project a quantitative survey was carried out to better understand the extent of the problem and the behavior of cyclists in Paris. Face-to-face interviews with 400 cyclists who drink alcohol more often than not were conducted.

The survey took place in May-June 2019. The interview sites were diversified in order to capture different user profiles (use, socio-professional category). For the same reasons, the hours of the survey varied during the day (morning - lunch break - afternoon - evening) and the days of the week (working day - weekend). The location of the survey and its spatio-temporal anchorage were recorded and integrated into the statistical models as explanatory variables.

The sample obtained includes a large age range with an average of 36,9 years with a standard deviation of 15 years. It is made up of 2/3 by males and 35% by senior and middle aged people with varying incomes. In terms of

consumption, the sample appears to be in line with figures from the World Health Organization (WHO) for France. Frequencies and quantities of consumption are high, mainly for beverages such as beer and wine (82,5%). The sample includes both frequent and occasional cyclists. The distances traveled far exceed the last kilometer. It appears that this is rather door-to-door trips. In addition, 28% of respondents use the bike mainly for their evening outings. This high percentage confirms the initial hypothesis concerning this pattern of use and the risks that may be associated with it.

It is interesting that almost 1/3 of the interviewees declare having already been involved in an accident as cyclists. The same percentage applies practically for passenger cars (VP). Also, only 16% of the interviewees were checked by the police as cyclists but the number of checks doubled between 2016 (10) and 2018 (23). Cyclists seem to be well aware of the risk associated with cycling under the influence of alcohol (92.8%) but think 70% that driving a car under the influence of alcohol is no less dangerous. They are 46% to cycle under the influence of alcohol more or less often but only 10% to ride a bicycle under the influence of narcotics. At first, it appears that this practice mainly affects bike owners and less users of self-service bicycles.

Due to the large number of data collected, the attempt was made to partition all responses into a small number of groups representing as closely as possible the typical user profiles. Clustering made it possible to identify two main populations within the sample:

- a rather young population whose main means of transport apart from the bicycle, is public transport. For these individuals, alcohol consumption is higher than the sample average, and most of them have already experienced driving a bicycle after drinking alcohol.
- a more heterogeneous population, whose alcohol consumption is more moderate. For these individuals, the use of a bicycle under the influence of alcohol is a minority.

This result confirms the initial intuition that young people are over-represented in this pattern.

In an effort to generalize the results, two logistic regression models were developed: one for the practice of riding under the influence of alcohol (model I) and one for cycling under the influence of drugs (model II). Model I (alcohol) indicates that the likelihood of driving a bicycle under the influence of alcohol increases with the frequency of bicycle use, the use of self-service bicycles, the use of public transport as an alternative to cycling, young age, being a man and student. This result is in complete agreement with the group identified as 'at risk' during clustering.

Beyond this, the model revealed two additional elements. First, the lack of knowledge of risks is a significant precursor of risky behavior. Second, there is a significant spatial heterogeneity since the phenomenon is not of the same magnitude everywhere in Paris. Targeted awareness campaigns (young students with no awareness of risk), including using billboards in the most affected areas, seem to be the most effective measure. Finally, model II (drugs) confirms the previous findings and reveals a certain correlation between the consumption of drugs and alcohol.

5. Synthesis and conclusions

The present paper comprises of an overview of the contemporary situation concerning Cycling Under Influence (CUI), based on a questionnaire survey with responses from 15 IRTAD member countries, in order to collect detailed data and information from relevant stakeholders.

The most important remarks that originate from this study are the following:

- In many countries, safe cycling is beginning to attract growing attention; related **rules and legislation** regarding various aspects of cycling have been adopted, namely for obligatory cyclist and bicycle equipment, for BAC limits, etc., and delimited cycle paths are being constructed.
- On the other hand, the vulnerability of cyclists is not fully realized, as shown by the **lack of mandatory protective equipment**; in half of the countries, a helmet is mandatory only up to a certain age and in twelve out of fifteen countries no other protective gear is required.
- The need for specific cycling skills is recognized only in approximately half of the responding countries, as implied by the **minimum age** restrictions. The most common minimum age for allowing independent cycling on the road is ten to twelve years old.
- The **CUI problem is not appropriately addressed in most countries**. In four countries there is no BAC limit at all; in seven countries BAC limit for cyclists is the same as the one for drivers, not taking therefore

into account the increased effects of alcohol and/or drugs to cyclists as well as their inevitable vulnerability as road users. A special fine or other type of penalty for cyclists driving under the influence of alcohol and/or drugs exists only in nine countries, and in most countries respondents did not report any specific measures aiming to prevent or reduce the consequences of CUI.

- CUI is an **increasing problem of young cyclists in Paris**. Being a young, male, student and frequent cyclist, using self-service bicycles and using public transport as an alternative to cycling form the profile of the most probable offender.

Therefore, it is evident that despite the strong increase in the modal share of cycling in many countries, the subject of cycling under the influence of alcohol and drugs does not seem to have attracted enough attention from researchers and authorities. In addition, an even greater increase in bicycle mileage in the near future is expected, as all major cities are in the process of studying or setting up an extensive network of cycle paths, and active transport is becoming an important part of urban mobility. Cycling under the influence of alcohol and/or drugs is a problem growing in parallel with cycling itself.

The overview and discussion on CUI practices is expected to assist in the identification and prioritisation of CUI needs. The legislative treatment of cycling issues that include minimum age for cycling, the use of cycle paths, the definition of BAC limits and assorted sanctions and the mandatory use of protective equipment can help tackle the problem of CUI and reduce its consequences. Furthermore, analyses of the existing data on CUI related road safety outcomes and collection of cycling exposure data and performance indicators are necessary to better understand the problem of CUI and identify evidence-based solutions.

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